UNIVERSITI PUTRA MALAYSIA

EFFECTS OF GAMMA ORYZANOL SUPPLEMENTATION ON LIPID PROFILE, ANABOLIC/CATABOLIC HORMONES, CIRCULATING BINDING PROTEINS AND ANTHROPOMETRIC CHANGES IN YOUNG MALES DURING RESISTANCE TRAINING

SAGHAR ESLAMI

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By

SAGHAR ESLAMI

Thesis Submitted to School of Graduate Studies, Universiti Putra Malaysia, in Fulfillment of Degree of Doctor of Philosophy

July 2012

DEDICATION

This thesis is dedicated to my parents who have supported me all the way since the beginning of my studies.

Also, this thesis is dedicated to my fiancé who has been a great source of motivation and inspiration.

Finally, this thesis is dedicated to all those who believe in the richness of learning.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for degree of Doctor of Philosophy

EFFECT OF GAMMA ORYZANOL SUPPLEMENTATION ON LIPID PROFILE, ANABOLIC/CATABOLIC HORMONES, CIRCULATING BINDING PROTEINS AND ANTHROPOMETRIC CHANGES IN YOUNG MALES DURING RESISTANCE TRAINING

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Chair: **Associate Professor Norhaizan Mohd. Esa, PhD**

Faculty: **Medicine & Health Sciences**

Resistance training is an element of conditioning and training for almost any sports. Speeded muscle strength increments are seen whenever resistance exercise is joined by the consumption of nutritional supplements. Although, there are very limited researches about the efficacy of gamma oryzanol supplementation with resistance exercise in humans, the usage of gamma oryzanol in strength athletes is prevalent. The aim of this single blind, placebo-controlled, randomized intervention trial is to determine the effects of dietary 600 mg/day gamma oryzanol supplementation during a 9-week resistance training program on altering lipid profile, anabolic/catabolic hormones, circulating binding proteins and anthropometric measures of young males during resistance training.

Thirty two eligible males with no continuous resistance training experience during six months before the study participation, with age 18-24 years were selected for the study. They were randomized into two groups (either 600 mg of gamma oryzanol or lactose in the form of capsules). Prior to the study commencement, subjects' one-

Repetition Maximum (1-RM) was determined by means of 1-RM strength tests on the regular leg curl and bench press machine, which was repeated on the last day of study. On the commencement day and the last day of the study, they were examined for anthropometric and body measurements. Supervised resistance training was performed four times a week, performing three sets (consisting of 6–12 repetitions) per exercise with three minutes rest, for a period of 9 weeks for each participant, accompanied with the consumption of supplement. At the study commencement in two times, before and after the acute resistance exercise, and at the end of the 9-week and 24 hours after the last resistance exercise performance, blood sampling were taken following 10-12 hour fast. Independent sample t-test and general linear model were applied to compare within and between group differences in mean scores. In terms of analyzing hormonal changes and blood protein levels over 4 time points of sampling, data were analyzed with 2×4 (Group × Time points) repeated measures analysis of variance. Bonferroni corrected post hoc test was used for analyzing difference of changes between time points. All testing of hypotheses were two-tailed, with significant judgment by 95% confidence interval and $p<0.05$.

There was no significant difference between the baseline characteristics and the target variables at baseline. In terms of anthropometric changes, there was no significant change between the supplement and placebo groups after the 9-week intervention. On the other hand, 1-RM of bench press ($p<0.001$) and leg curl ($p=0.005$), which are markers of muscle strength increased after gamma oryzanol supplementation in the supplement group compared with placebo group.

Among markers of blood lipid profile, very low-density lipoprotein (VLDL-C) ($p=0.034$) and triglyceride (TG) ($p=0.027$) levels declined in the supplement group

greater than the placebo group after the 9-week supplementation which shows the effect of gamma oryzanol supplementation on decreasing these markers, but no difference has been shown for high-density lipoprotein (HDL-C), low-density lipoprotein (LDL-C) and total cholesterol (TC) ($p>0.05$). In terms of serum mineral concentration, there was only significant difference between the supplement and placebo groups for zinc concentration after the 9-week intervention.

During the study, it has been observed that gamma oryzanol affected on total testosterone ($p=0.041$), cortisol ($p=0.010$) and growth hormone (GH) ($p=0.047$) levels, unlike free testosterone, triiodothyronine (T3), thyroxine (T4), thyroid-stimulating hormone (TSH), insulin-like growth factor-I (IGF-I), estradiol, dehydroepiandrosterone sulfate (DHEAS), sex hormone-binding globulin (SHBG), epinephrine, norepinephrine and insulin-like growth factor-binding protein 3 (IGFBP3) ($p>0.05$). Moreover, testosterone to cortisol ratio significantly changed ($p<0.001$) in the supplement group compared with the placebo group; however, no significant change was shown for total testosterone to SHBG ratio ($p>0.05$) between the supplement and placebo groups.

In conclusion, the current study demonstrated that gamma oryzanol supplementation may benefit resistance athletes to improve anabolic markers as well as increasing muscle strength. However, this supplement could not improve all markers of interest and more researches need to be carried out for understanding the mechanism of effects and substitute this supplement with harmful hormonal drugs and supplements.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

KESAN SUPLEMEN GAMMA ORIZANOL KE ATAS PROFIL LIPID, HORMON ANABOLIK / KATABOLIK, 'CIRCULATING BINDING PROTEIN' DAN PERUBAHAN ANTROPOMETRI DI KALANGAN LELAKI MUDA SEMASA LATIHAN RINTANGAN

Oleh

SAGHAR ESLAMI

Julai 2012

Pengerusi: Profesor Madya Norhaizan Bt. Mohd. Esa, PhD

Fakulti: Perubatan & Sains Kesihatan

Latihan rintangan adalah satu elemen 'conditioning' dan latihan untuk hampir semua jenis sukan. Peningkatan kekuatan otot dilihat apabila senaman rintangan disertai oleh pengambilan makanan tambahan. Walaupun kajian terhadap keberkesanan suplemen gamma orizanol dengan senaman rintangan pada manusia adalah amat terhad, tetapi penggunaan gamma orizanol dalam atlet begitu berleluasa. Matlamat ujikaji 'single-blind', dikawal oleh placebo dan intervensi percubaan campur tangan rawak ini adalah untuk menentukan kesan pengambilan supplemen gamma orizanol 600mg/hari dalam diet selama 9 minggu dalam program latihan rintangan akan mengubah dengan signifikan profil lipid, hormon anabolik/katabolik, 'circulating binding protein' dan ukuran antropometri di kalangan lelaki muda semasa latihan rintangan.

Tiga puluh dua orang lelaki yang layak tanpa pengalaman menyertai latihan rintangan yang berterusan lebih daripada enam bulan sebelum menyertaan kajian ini, dengan umur 18-24 tahun telah dipilih untuk kajian. Mereka dibahagikan secara rawak kepada dua kumpulan (sama ada 600mg gamma orizanol atau laktosa dalam

bentuk kapsul). Sebelum kajian dimulakan, ulangan maksimum (1-RM) subjek ditentukan melalui ujian kekuatan 1-RM manggunakan mesin 'leg curl', dan 'bench press machine', yang mana ianya akan diulang lagi pada hari terakhir kajian. Pada awal dan akhir kajian, ukuran antropometeri dan badan responden diambil. Latihan jenis rintangan yang diselia dilakukan sebanyak empat kali seminggu, 3 set (terdiri daripada 6-12 ulangan) setiap senaman dengan 3 minit rehat, untuk tempoh 9 minggu bagi setiap peserta bersama dengan pengambilan makanan tambahan. Pada permulaan dua kajian ini iaitu sebelum dan selepas rintangan akut dijalankan, dan pada akhir minggu ke 9 dan 24 jam selepas senaman rintangan yang terakhir, pengukuran serta pensampelan darah dilakukan selepas 10-12 jam berpuasa, di tempat yang sama di mana responden menjalani latihan. Sampel Bebas Ujian-t dan model linear umum telah digunakan untuk membandingkan perbezaan di dalam dan di antara kumpulan dalam skor min. Dari segi analisis perubahan hormon dan paras 'protein' dalam darah untuk empat waktu persampelan, data telah dianalisis dengan 2 × 4 (Kumpulan × waktu pensampelan) analisis variasi berulang. Ujian 'Post hoc corrected bonferroni' telah digunakan untuk menganalisis perbezaan perubahan antara masa. Semua ujian hipotesis adalah 'two-tailed' dan signifikan sekiranya selang keyakinan adalah 95% dan $p < 0.05$.

Tiada perbezaan yang signifikan di antara ciri-ciri awal dengan pembolehubah sasaran di peringkat awal. Dari segi perubahan antropometri, tidak terdapat perbezaan yang signifikan di antara kumpulan yang mengambil gamma orizanol dan plasebo selepas 9 minggu intervensi. Sebaliknya, '1-RM bench press' ($p<0.001$) dan 'leg curl' ($p = 0.005$), iaitu penanda kekuatan otot telah meningkat pada responden yang menerima suplemen gamma orizanol berbanding kumpulan plasebo.

Antara petanda profil lipid darah, paras VLD-C ($p = 0.034$) dan TG ($p = 0.027$) menurun dengan lebih banyak dalam kumpulan yang menerima gamma orizanol berbanding kumpulan plasebo selepas 9 minggu tempoh rawatan tetapi tiada perbezaan yang signifikan ditunjukkan untuk HDL-C, LDL-C dan TC ($p > 0.05$). Untuk mengkaji perubahan kepekatan seram mineral, hanya terdapat perbezaan yang signifikan dalam kepekatan zink di antara kumpalan makanan tambahan dan plasebo selepas intervensi selama 9 minggu.

Bagi hormon pula, kesan yang penting selepas pengambilan makanan tambahan ini hanya diperhatikan untuk jumlah testosteron ($p = 0.041$), kortisol ($p = 0.010$), GH ($p = 0.047$), tetapi tidak bagi testosteron bebas, T3, T4, TSH, IGF-I, estradiol, DHEAS, SHBG, adrenalina, norepinephrine, IGFBP3 ($p>0.05$). Tambahan pula, nisbah testosteron kepada kortisol berubah dengan ketara ($p<0.001$), namun tiada perubahan yang signifikan ditunjukkan untuk nisbah jumlah testosteron kepada SHBG ($p > 0.05$) di antara dua kumpulan.

Kesimpulannya, kajian ini menunjukkan bahawa suplementasi gamma orizanol boleh memberi manfaat kepada atlet rintangan untuk meningkatkan penanda anabolik serta meningkatkan kekuatan otot. Walau bagaimanapun, pengambilan makanan tambahan ini tidak dapat memperbaiki semua penanda yang penting. Oleh itu penyelidikan lebih lanjut perlu dijalankan untuk memahami kesan mekanisme ini dan menyediakan keadaan yang lebih baik untuk menggantikan dadah berbahaya dan hormon dengan supplemen tambahan ini.

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I certify that a Thesis Examination Committee has met on 24th July 2012 to conduct the final examination of Saghar Eslami on her thesis entitled "Effect of Gamma Oryzanol Supplementation on Lipid Profile, Anabolic/Catabolic Hormones, Circulating Binding Proteins and Anthropometric Changes in Young Resistance Athletes" in accordance with the Universities and University Colleges Act 1971 and the constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.
Members of Thesis Examination Committee were as follows:

Amin Ismail, PhD
Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Chairman)

Mohd Nasir Bin Mohd Taib, PhD
Lecturer
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Internal Examiner)

Soh Kim Geok
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Internal Examiner)

Takafumi Hamaoka
Associate Professor
Collage of Sport and Health Sciences
Ritsumeikan University
(External Examiner)

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

Norhaizan Bt Mohd Esa, PhD
Associate Professor
Faculty of Medicine & Health Sciences
Universiti Putra Malaysia, Selangor
(Chairman)

Hazizi Bin Abu Saad, PhD
Senior Lecturer
Faculty of Medicine & Health Sciences
Universiti Putra Malaysia, Selangor
(Member)

Zulkhairi Bin Haji Amom, PhD
Associate Professor
Faculty of Medicine & Health Sciences
Universiti Putra Malaysia, Selangor
(Member)

Seyed Ali Keshavarz, PhD
Professor
Department of Nutrition and Biochemistry/ School Of Public Health Research
Tehran University of Medical Sciences, Iran
(Member)

Majid Karandish, PhD
Associate Professor
Department of Nutrition/ Paramedical School
Ahwaz University of Medical Sciences, Ahwaz, Iran
(Member)

_____

BUJANG BIN KIM HUAT, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

DECLARATION

I declare that the thesis is my original work except for quotations and citations, which have been duly acknowledged. I also declare that it has not been previously and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or other institutions.

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SAGHAR ESLAMI

Date: 24 July 2012

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